

Effective Date: October 25, 2006

## Material Safety Data Sheet

**FOR EMERGENCY CALL CHEMTREC – (800) 424-9300**

### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Urea Ammonium Nitrate Solution (UAN)

**CAS Number:** 15978-77-5

**Product Uses**

**Agricultural Industry:** Fertilizer

**Chemical Name:** Urea Ammonium Nitrate (UAN)

**Chemical Family:** Nitrogen Fertilizer Solution

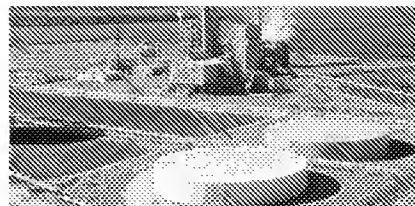
**Synonyms and Common Trade Names:** UAN (28, 30, and 32%N)

**Company Identification**

**Manufacturer:** CF Industries, Inc.  
**Address:** 4 Parkway North, Suite 400  
 Deerfield, IL 60015-2590  
**Telephone:** 847-405-2400

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	Weight Percentage			CAS Number
	32%N	30%N	28%N	
Ammonium nitrate	43-48	40-45	37-42	6484-52-2
Urea	33-36	30-34	28-32	57-13-6
Water	19-20	24-26	29-31	7732-18-5



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### 3. HAZARDS IDENTIFICATION

#### Emergency Overview

**Warning!** Contact with liquid may cause irritation to the eyes and skin. Ingestion of large quantities may produce methemoglobinemia. Residues from this product may emit toxic oxides of nitrogen when heated to decomposition. Activities that result in drying or evaporating may result in the formation of ammonium nitrate, a strong oxidizer. Contact of ammonium nitrate with other materials may cause fire or explosion.

Colorless liquid with almost no odor or slight ammonia odor.

#### Potential Health Effects

**Eyes:** Eye irritant. Contact may cause stinging, watering and redness; swelling and eye damage.

**Skin:** Skin irritant. Contact may cause redness, itching, burning and skin damage. No harmful effects from skin absorption have been reported.

**Inhalation:** Low degree of toxicity by inhalation. Overexposure by inhalation of mists may cause irritation of the respiratory tract, headache, dizziness, transient disorientation and generalized tingling sensation.

**Ingestion:** Not found to be toxic by oral exposure. Ingestion of large amounts may cause nausea, vomiting, diarrhea and abdominal pain.

This material contains nitrate salts. Nitrates may be reduced by intestinal bacteria to nitrite. Absorption of nitrites may affect the blood (methemoglobinemia) and blood vessels (vasodilation and fall in blood pressure). Symptoms of toxicity may include headache, fainting, fatigue, cyanosis, confusion, irregular heartbeats and possible respiratory paralysis.

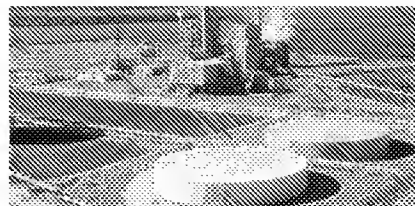
**Pre-Existing Medical Conditions:** Pre-existing heart or blood diseases may be aggravated by exposure to nitrates. Pre-existing respiratory or skin disorders may be aggravated by exposure to this material.

#### Late Toxicities

**Cancer:** Inadequate evidence available to evaluate the cancer hazard of this material. Not listed as a carcinogen by ACGIH, USEPA, IARC, NTP, or OSHA.

**Target Organs:** No data available.

**Developmental:** Inadequate data available for this material.



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#### 4. FIRST AID

**Eyes:** Move victim away from exposure and into fresh air. Hold eyelids open and flush eye(s) immediately with clean water for at least 15 minutes. Seek medical attention if necessary.

**Skin:** Remove contaminated shoes and clothing if necessary. Flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek medical attention.

**Inhalation:** Remove victim from source and allow to rest in well ventilated area. If breathing is difficult, obtain immediate medical attention.

**Ingestion:** If swallowed, seek emergency medical attention. If victim is drowsy or unconscious and vomiting, place on left side with the head down and do not give anything by mouth. Do not leave victim unattended and observe closely for adequacy of breathing.

**Notes to Physician:** Nitrates in large doses may cause significant vasodilation and hypotension. Pre-existing ischemic heart disease may be aggravated by these effects. In large ingestions nitrates may cause methemoglobinemia. Methemoglobinemia should be suspected if cyanosis occurs. Methylene blue is an effective antidote for symptomatic methemoglobinemia.

#### 5. FIRE FIGHTING MEASURES

**Flammability:** UAN is not flammable.

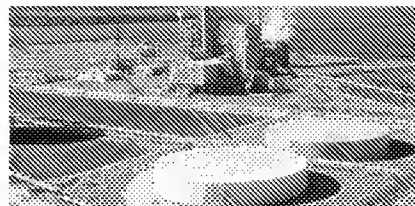
**Flash Point (test method):** Not applicable.

**Flammable Limits:** Not applicable.

**Explosive Limits:** Not applicable.

**Autoignition Temperature:** Not applicable.

**Extinguishing Media:** Use extinguishing agent suitable for type of surrounding fire.



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**NFPA Fire Rating:**

Flammability	0
Health Hazard	1
Reactivity	0
Specific Hazard	Not Applicable

**Key:** Least = 0    Slight = 1    Moderate = 2    High = 3    Extreme = 4

**Fire Fighting Instructions:** Nitrate salts can support combustion under certain conditions. Do not allow product to evaporate to dryness. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

**Unusual Fire and Explosive Hazards:** Closed containers exposed to extreme heat can rupture due to pressure buildup.

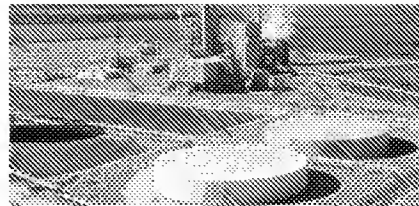
## 6. ACCIDENTAL RELEASE MEASURES

Isolate and stop discharge. Take immediate steps to contain the spill, if possible, and recover any reusable product. Consult federal, state or local regulatory agencies regarding proper disposal of residue.

**Neutralizing Chemicals:** Not applicable.

## 7. HANDLING AND STORAGE

**Handling:** Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Wash thoroughly after handling. Do not wear contaminated clothing or shoes. Use good personal hygiene practice.



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**Storage:** Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas free from combustibles and away from all sources of ignition. Outside or detached storage in specially designated areas is preferred. Store only in approved containers. UAN is mildly corrosive to carbon steel. Keep away from any incompatible material. Protect container(s) against corrosion and physical damage. Protect against extremes in temperature. Heating above 140°F will promote hydrolysis. Extreme cold (<32°F) may cause crystallization of the product. Do not allow liquid to evaporate. Solid ammonium nitrate residue can explode.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Ventilation:** Not applicable; product is not volatile.

### Preventative Measures / Specific Personal Protective Equipment

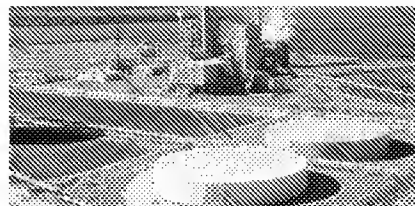
**Eyes:** Approved eye protection to safeguard against potential eye contact is recommended. Depending on conditions of use, goggles or a face shield may be necessary. Do not wear contact lenses.

**Skin:** The use of gloves impermeable to UAN is advised to prevent skin contact (see glove manufacturer literature for information on permeability). Impervious clothing should be worn as needed.

**Respiratory:** The requirement for respiratory protection depends on conditions of use. For ammonia vapor concentrations below 300 ppm and above standards, use a respirator with an ammonia cartridge or canister and a mist prefilter. For higher or unknown concentrations, use a self-contained breathing apparatus with a full-face piece operating in a pressure-demand mode.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

**Other:** Emergency showers and eye wash fountains should be readily available. Thoroughly clean shoes and wash contaminated clothing before reuse.



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### **Exposure Guidelines\***

Although standards for UAN solution, ammonium nitrate solution and urea solution have not been established by OSHA or ACGIH, the following standards for ammonia are applicable since UAN contains free ammonia.

ACGIH TLV: Ammonia: 25 ppm (17 mg/m<sup>3</sup>) TWA; 35 ppm (24 mg/m<sup>3</sup>) STEL

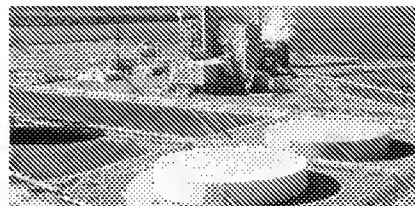
OSHA PEL: Ammonia: 50 ppm (35 mg/m<sup>3</sup>) TWA

NIOSH IDLH: Ammonia: 300 ppm

\* TLV = Threshold Limit Values; PEL = Permissible Exposure Limits;  
TWA = 8-hour Time-weighted Average; STEL = 15-minute Short Term Exposure Limit;  
IDLH = Immediately Dangerous to Life or Health

### **9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b>	Colorless liquid.
<b>Odor:</b>	Little or no detectable ammonia odor.
<b>Odor Threshold Level:</b>	Not available.
<b>Physical State:</b>	Liquid
<b>pH:</b>	7.0-7.5
<b>Vapor Pressure:</b>	(due to water component) @60°F (15.6°C) 0.11 psia for 28%N 0.06 psia for 32%N
<b>Vapor Density (Air = 1):</b>	Not applicable.
<b>Boiling point:</b>	>100°C (>212°F)
<b>Melting point:</b>	(salt out temperature) 1°F (-17°C) for 28%N 15°F (-9°C) for 30%N 29°F (-2°C) for 32%N
<b>Solubility in water:</b>	Miscible with water.



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<b>Specific gravity (H2O = 1):</b>	@60°F (15.6°C)
	1.28 (28%N)
	1.303 (30%N)
	1.326 (32%N)
<b>Bulk Density:</b>	10.66 lbs/gal (28%N)
	10.85 lbs/gal (30%N)
	11.04 lbs/gal (32% N)
<b>Evaporation rate (Butyl acetate = 1):</b>	Not applicable.
<b>Viscosity:</b>	@40°F (4.4°C)
	3.6 cP (28%N)
	6.1 cP (32%N)
	@60°F (15.6°C)
	2.9 cP (28%N)
	4.7 cP (32%N)
<b>Percentage volatile by volume (%):</b>	Not applicable.
<b>Molecular weight:</b>	Not applicable.
<b>Molecular formula:</b>	(3 compound mixture)
	Urea--CO(NH <sub>2</sub> ) <sub>2</sub> ,
	Ammonium Nitrate--NH <sub>4</sub> NO <sub>3</sub> , and
	Water--H <sub>2</sub> O
<b>Water/Oil Distribution Coefficient:</b>	Urea -1.59, Ammonium Nitrate -3.1

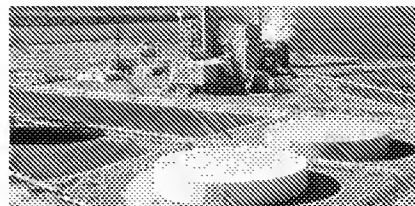
## **10. STABILITY AND REACTIVITY**

**Stability (thermal, light, etc.):** Stable under normal conditions of storage and handling.

**Incompatibility (Materials to avoid):** Avoid contact with combustible, organic, or other readily oxidizable materials. Avoid contact with strong acids and chlorates or other strong oxidizers. Contact with alkaline materials may liberate ammonia. Corrosive to brass and copper.

**Hazardous Decomposition Products:** Material will not burn, but if involved in a fire, oxides of carbon and nitrogen may be generated. Exposure to heat may liberate ammonia fumes. When the water in UAN evaporates, it leaves a residue of solid ammonium nitrate and urea. Solid ammonium nitrate can explode.

**Hazardous Polymerization:** Will not occur.



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**Conditions to Avoid:** High temperatures - components decompose and emit toxic gases. High pressures - explodes if heated under confinement so that pressure builds up. Do not allow material to evaporate to dryness.

## IX. TOXICOLOGICAL INFORMATION

### Urea Ammonium Nitrate

**Oral rat LD50:** >2,000 mg/kg

**Dermal LD50:** No data available.

**Inhalation LC50:** No data available.

**Mutagenicity:** No data available.

**Teratogenicity:** No data available.

**Sensitization Capability:** No data available.

**Synergistic Chemicals:** No data available.

There is no definitive information available on carcinogenicity, mutagenicity, target organs or developmental toxicity for this product.

### Ammonium Nitrate

**Oral rat LD50:** 2,217 – 2,950 mg/kg

**Dermal LD50:** >5,000 mg/kg

**Inhalation rat 4 hour LC50:** >88,800 mg/m<sup>3</sup>

**Mutagenicity:** Ammonium nitrate was negative in tests of bacterial mutagenicity.

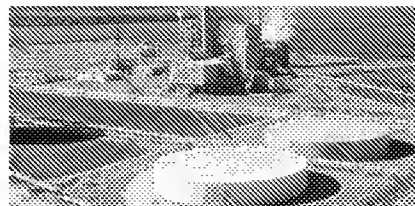
**Teratogenicity:** The treatment of rats to 57 mg/kg/day during gestation did not cause teratogenic effects. The body weight of the offspring was reduced.

**Sensitization Capability:** No data available.

**Synergistic Chemicals:** No data available.

**Subchronic Toxicity:** Rats exposed by inhalation to 26-185 mg/m<sup>3</sup>, 5 hours/day, 5 days/week for 2 weeks did not demonstrate effects. Rats and guinea pigs exposed to 1 mg/m<sup>3</sup>, 6 hours/day, 5 days/week for 4 weeks demonstrated no significant effects on body weight, lung volume, vital capacity, or histologic structure of ciliated epithelial cells of the respiratory





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tract in either species.

Ammonium Nitrate is not recognized as a carcinogen by IARC, NTP, or OSHA.

## Urea

**Oral rat LD50:** Ranges from 11.5 g/kg (female mouse) to 15 g/kg (female rat)

**Dermal LD50:** No data available.

**Inhalation LC50:** No data available.

Urea dust at 22 mg/m<sup>3</sup> caused mild irritation (species not specified)

**Sensitization Capability:** No data available.

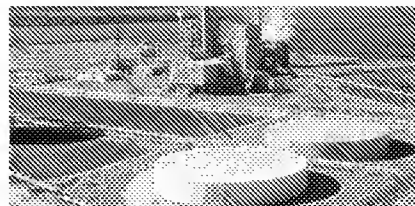
**Synergistic Chemicals:** No data available.

**Subchronic Toxicity:** In a repeated dose toxicity study, urea at 10%, 20%, and 40% in ointment was applied to the back skin of rats for 4 weeks. No dose-dependent toxicity was observed. There were no consistent treatment-related effects on standard hematological parameters, clinical chemistry, organ weights or organ histopathology, including the testicles, prostate, seminal vesicles, ovaries and the uterus.

**Chronic Toxicity:** In a chronic toxicity and carcinogenicity screening study conducted in mice over 12 months, urea was administered at 0, 0.45%, 0.9%, and 4.5% in the diet. No pathology was reported immediately following treatment period. After 4 months, testes, prostate, and uterus were histologically examined for occurrence of tumors in the survivors. Although there was a statistically increased incidence of interstitial cell adenomas of the testis in the high dose group, its biological significance was deemed questionable, since the lesion may occur in 100% of controls.

**Teratogenicity:** In a single oral dose study in mice, 2,000 mg/kg administered on day 10 of pregnancy was not teratogenic. Urea in water was given in 2 doses 12 hours apart by gavage to rats during pregnancy for 14 days and the dams were allowed to deliver. No hypertrophy or other kidney changes were detected nor were any teratogenic effects noted. Urea caused developmental effects in chick embryos when injected into eggs.

**Mutagenicity:** Urea was negative in tests of bacterial mutagenicity and demonstrated low clastogenic potential in non-bacterial mutagenicity tests. Chromosome breakage has been observed in some laboratory tests using extremely high concentrations of urea. At near-lethal doses, urea was mutagenic in in-vivo non-bacterial tests in mice.



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Urea is not recognized as a carcinogen by IARC, NTP, or OSHA.

## 12. ECOLOGICAL INFORMATION

### Urea Ammonium Nitrate

UAN is non-toxic to aquatic organisms as defined by USEPA.

**Fish 96 hour LC50 (rainbow trout):** >103 mg/L

**Fish 96 hour LC50 (flathead minnow):** between 100 and 500 mg/L

### Ammonium Nitrate

Fertilizers containing ammonium nitrate solution can cause poisoning in livestock and poultry. Ammonium nitrate solution can be toxic to aquatic life and spills may cause algal blooms in static waters.

Slightly toxic to aquatic organisms as defined by USEPA

**Fish 48 hour LC50:** 95-102 mg total  $\text{NH}_3/\text{L}$

**Daphnia EC50:** 124.9 mg total  $\text{NH}_3/\text{L}$

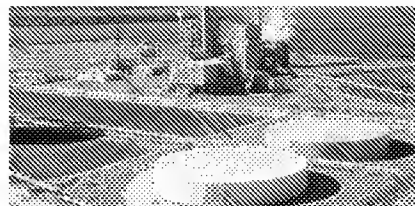
**Ecotoxicity Information:** The measured ecotoxicity values for ammonium nitrate include carp 48-hour  $\text{LC}_{50}$  values of 74,000  $\mu\text{g}/\text{L}$  (total) and 947  $\mu\text{g}/\text{L}$  (un-ionized) reported in terms of nitrogen. The minimum lethal concentration of ammonium nitrate for tadpoles is 910 mg/L. Nitrate ion ecotoxicity values are also available. The freshwater 96-hour and 7-day  $\text{LC}_{50}$  values for fingerling rainbow trout are reported to be 1,350 and 1,065 mg/L nitrate nitrogen, respectively. No effects on growth or feeding activities were observed in largemouth bass and channel catfish exposed to nitrate ion concentrations of 400 mg/L.

**Environmental Fate Information:** Nitrate ions are assimilated by growing plants. Ammonium nitrate will also be taken up by bacteria. In anaerobic soils, nitrate ions may be converted to nitrite, molecular nitrogen, nitrous oxide, or ammonium ions.

### Urea

Large amounts of urea can damage plant seedlings and inhibit germination. As a readily available source of nitrogen, urea can also foster excessive growth of algae or microorganisms in water systems.

Urea is non-toxic to aquatic organisms as defined by USEPA.



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**Fish 96 hour LC50:** >9,100 mg/L

**Daphnia 24 hour EC50:** >10,000 mg/L

**Ecotoxicity Information:** The cell multiplication toxicity threshold values for bacteria, green algae, and protozoa are >10,000, >10,000, and 29 mg/L, respectively. The critical range for the creek chub is 16,000 to 30,000 mg/L in Detroit river water.

**Environmental Fate Information:** In the soil, urea degrades rapidly, usually within 24 hours; however, degradation may be slower depending on soil type, moisture content, and urea formulation. The ultimate degradation products are carbon dioxide and ammonia. The soil mobility is high based on an organic carbon partition coefficient of 8. In water, biodegradation to carbon dioxide and ammonia is the major fate pathway. The biodegradation rate increases with increasing temperature and presence of phytoplankton. Oxidation of urea by nitrifying bacteria can increase biological oxygen demand. Bioaccumulation of urea is very low. The 72-hour bioconcentration factor (BCF) for carp is reported to be 1.

### 13. DISPOSAL CONSIDERATIONS

UAN is not considered a hazardous waste under Federal Hazardous Waste Regulations 40 CFR 261. Consult local and state environmental regulatory agencies for acceptable alternative disposal procedures and locations. Follow standard disposal procedures.

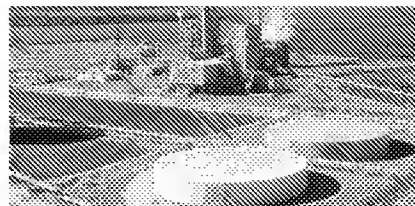
### 14. TRANSPORT INFORMATION

UAN is not listed as a hazardous material by the U.S. Department of Transportation (DOT), Transport Canada (TC) and the United Nations (UN).

### 15. REGULATORY INFORMATION

**OSHA (Occupational Safety and Health Administration):** This material is considered to be hazardous as defined by the OSHA Hazard Communication Standard.

**SARA TITLE III (Superfund Amendment and Reauthorization Act of 1986):** This product contains the following toxic chemicals subject to the reporting requirements of Section 302 and/or Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372:



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CAS No.	Chemical Name	Amount of Chemical in CFI Product (% by weight)	302 Threshold Planning Quantity for Chemical (lbs.)	313 De Minimis Concentration (% by weight)
6484-52-2	Ammonium Nitrate <sup>1</sup>	37– 48	Not Listed	1.0
	Nitrate Compounds as Nitrate (NO <sub>3</sub> ) <sup>1</sup>	28.7 – 36.9	Not Listed	NA
7664-41-7	Ammonia from Ammonium (TRI 10% rule)	0.8 – 1.1	500	1.0

<sup>1</sup>A nitrate compound is covered by TRI regulations only when in water and only if dissociated. The complete weight of the nitrate compound is used for threshold determinations. Only the nitrate portion is used for release calculations.

User should contact local, state and/or provincial regulatory agencies for information on additional or more stringent reporting requirements.

**Sections 311/312:** This product has been reviewed according to the USEPA "Hazard Categories" promulgated under Sections 311 and 312 of SARA Title III and is considered, under applicable definitions, to meet the following categories:

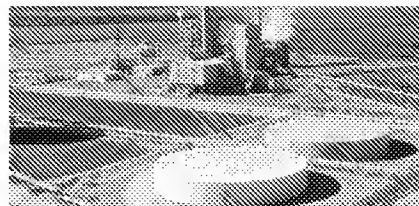
Acute: yes    Chronic: no    Fire: no    Reactivity: no

**U.S. Coast Guard:** Designated as a hazardous material under 46 CFR 153.4 (e) that is subject to U.S. Coast Guard regulations at 33 CFR 154 and 33 CFR 156 when transferred in bulk to or from a marine vessel with a total storage capacity of 250 or more barrels.

**DOT (Department of Transportation):** Please refer to Section 14 (Transport Information) for guidance concerning transportation.

**Proposition 65:** NOT LISTED

This material has not been identified as a carcinogen by NTP, IARC or OSHA.



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### 13. DOCUMENTARY INFORMATION AND DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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MSDS Prepared By: Environmental Health Decisions (949-481-8600)  
Preparation Date: 9/15/06  
Issue Date: 10/25/06  
Previous Issue Date: 11/03/03

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